We claim:-

1. A method of operating an adsorption refrigeration system, the system comprising an adsorption pump which, in use, is arranged in communication with a chamber containing liquid and gaseous coolant, the method comprising:-

i) expanding the gaseous coolant into an auxiliary volume member so as to cause the removal of part of the gaseous coolant from the chamber, thereby reducing the temperature and pressure of the gaseous coolant in the chamber; and

ii) operating the adsorption pump so as to further cool the chamber by causing the evaporation of the coolant liquid within the chamber.

2. A method according to claim 1, wherein step (i) further comprises expanding the gaseous coolant separately into a number of additional auxiliary volume members.

3. A method according to claim 1, further comprising, prior to the expansion step (i), supplying a quantity of the gaseous coolant to the adsorption refrigeration system, in excess of the saturation limit of the adsorbent material within the adsorption pump when operating under normal working conditions.

4. A method according to claim 3, wherein the gaseous coolant is supplied from an auxiliary volume member prior to step (i).

5. A method according to claim 3, wherein, prior to step (i), the temperature and pressure of the gaseous coolant in the chamber are about 4 Kelvin and 0.5 Bar respectively.

6. A method according to claim 3, wherein, during the initial supply of gaseous coolant, the adsorption pump is cooled such that the adsorption material contained therein adsorbs coolant gas so as to become substantially saturated.

7. A method according to claim 1, wherein the expansion of the gaseous coolant during step (i) causes partial liquefaction of the coolant.

8. A method according to claim 3, wherein following the initial supply of the gaseous coolant, the adsorption pump is heated so as to desorb coolant and thereby increase the pressure of the gaseous coolant in the chamber.

9. A method according to claim 8, wherein the adsorption pump is heated during step (i).

10. A method according to claim 8, wherein the adsorption pump is heated to about 100K whilst the chamber is maintained at a temperature of about 4K.

11. A method according to claim 7, wherein, prior to step (ii) the adsorption pump is cooled thereby further reducing the pressure of the gaseous coolant within the chamber.

12. A method according to claim 11, wherein the reduction of the gaseous coolant pressure due to the cooling of the adsorption pump causes partial liquefaction of the coolant.

13. A method according to claim 1, wherein during the or each step (i) the gaseous coolant is expanded into a storage reservoir.

14. A method according to claim 1, wherein the gaseous coolant is expanded into a second adsorption pump.

15. A method according to claim 1, wherein during step (i) the volume and/or temperature of the auxiliary volume member is varied.

16. A method according to claim 1, wherein the capacity of the auxiliary volume member is greater than the gas adsorption capacity of the adsorption pump.

17. A method according to claim 1, wherein the expansion of the coolant gases into the auxiliary volume is controlled using a valve.

18. A method according to claim 1, wherein the communication of the adsorption pumps and chamber is controlled using a valve.

19. A method according to claim 1, wherein the adsorption pump and chamber are isolated from the auxiliary volume member during step (ii).

20. A method according claim 1, wherein the coolant comprises any of helium-3, helium-4, nitrogen, hydrogen, or neon.

21. A method according to claim 1, wherein the expansion of the gaseous coolant during the or each step (i) is substantially adiabatic.